Golder Associates Inc.

1630 Heritage Landing, Suite 103
St. Charles, MO USA 63303
Telephone (314) 936-1554
Fax (314) 936-1135

Golder Associates

June 7, 1996

Our Ref: 943-2848.601

Site: West Lake
ID # MOD079900932
Break: 10.9 002
Other: Progress Report
6-7-96

U.S. Environmental Protection Agency
Region VII
WSTM/SPFD/REML
726 Minnesota Avenue
Kansas City, Kansas 66101

Attention: Mr. Steven Kinser

RE: MONTHLY PROGRESS REPORT - MAY 1996
WEST LAKE (BRIDGETON) LANDFILL
OPERABLE UNIT 2 RI/FS

40056616
SUPERFUND RECORDS

Dear Mr. Kinser:

On behalf of Laidlaw Waste Systems, Inc. (Laidlaw), Golder Associates Inc. (Golder) has prepared the following progress report in accordance with Section XIII, Paragraph 39 of the Administrative Order on Consent (Consent Order), EPA Docket No. VII-94-F-0025. The progress report describes activities conducted in May 1996.

I. ACTIONS TAKEN TO COMPLY WITH THE CONSENT ORDER

Activities conducted in May include collection of monthly water levels. Water level monitoring conducted in May included piezometers and wells adjacent to the Operable Unit 1 area in addition to the Operable Unit 2 piezometers, wells, and leachate risers.

II. VALIDATED RESULTS RECEIVED

The attached Tables 1 and 2 list water level data collected from the piezometers and wells. Table 1 presents data for OU-2 monitoring points; Table 2 presents data for OU-1 monitoring points.

Attachment 1 includes groundwater quality data for background monitoring wells MW-300-AS, MW-300-AD, MW-300-SS, S-80, I-50, and MW-107. These wells are located in the southern portion of the site, south of the leachate retention pond. Please refer to the Monitoring Location Map previously provided as an attachment to the March 1996 monthly progress report for precise well locations.

The wells were sampled to provide an indication of background groundwater quality in both the alluvium (MW-300-AS, MW-300-AD, S-80, I-50, and MW-107) and bedrock (MW-300-SS). The following parameter groups were included in the analyses:

- Major ions (calcium, potassium, magnesium, sodium, chloride. sulfate, bicarbonate as alkalinity);
- Nitrate/nitrite;
- Chemical oxygen demand (COD); and,
- Radionuclides (gross alpha, gross beta, radium-226, radium-228, uranium-238, uranium-235/236, uranium-234, thorium-232, thorium-230, thorium-228), collected as both filtered (dissolved) and unfiltered (total).

The off-schedule groundwater quality samples were collected in December of 1995, after receipt of verbal approval by EPA to conduct the sampling. Data validation was completed in May of 1996. The validation summary letter is included in Attachment 1. Laidlaw had proposed the off-schedule groundwater sampling due to sale of the property, owned by others, surrounding these particular wells and piezometers. As discussed in the April 1996 monthly progress report dated May 9, 1996, development began immediately after sale of the property, and the wells included in the off-schedule sampling have been decommissioned, with the exception of MW-107. Monitoring well MW-107 will continue to provide background alluvial groundwater quality data, and monitoring well MW-301-SS will provide background bedrock groundwater quality data.

Summary tables of the results are included as Table 3 and Table 4. All data were validated as acceptable, with the exception of COD and nitrate/nitrite in the unfiltered sample collected from MW-300-SS. The lid to the MW-300-SS sample bottle to be analyzed for COD and nitrate/nitrite opened during transport to the laboratory, and a portion of the sample had drained into a plastic bag that had been sealed around the sample bottle. The COD and nitrate/nitrite analyses for the sample bottle/plastic bag sample were rejected. To avoid an incomplete data set, Laidlaw authorized the laboratory to analyze COD and nitrate/nitrite from a second MW-300-SS sample bottle. The COD and nitrate/nitrite analyses from the second sample bottle are validated as acceptable and are shown on Table 3.

III. WORK PLANNED DURING JUNE AND JULY 1996

Activities planned for June and July 1996 include the following:

- Continuation of the Technical Memorandum on Physical Characterization. Based on verbal discussions with EPA, submittal of the Technical Memorandum on Physical

Characterization is scheduled for August 1, 1996, regardless of whether or not validated data from the OU-1 wells are available.

- Collection of monthly water levels.

IV. MATERIAL PROBLEMS ENCOUNTERED OR ANTICIPATED MATERIAL DELAYS

No material delays were encountered in May, and none are anticipated for June and July.

If you have any questions or comments, please contact Mr. Doug Borro, the Respondent's designated Project Coordinator, or the undersigned.

Sincerely,

GOLDER ASSOCIATES INC.

Ward E. Herst, CPHG, CEM
Program Director - Hydrology
Associate

WEH/cl

Attachments

cc: Michael Hockley, Esq., Spencer Fane Britt & Browne
Doug Borro, Laidlaw Waste Systems, Inc.
Doug Wagner, Laidlaw Waste Systems, Inc.
Larry Giroux, Laidlaw Waste Systems, Inc.
Jalal El-Jayyoufi - Missouri Department of Natural Resources
David Heinze - McLaren/Hart
Paul Rosasco - Engineering Management Support, Inc.

2848may2.doc

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
Shallow Alluvial Piezometers					
PZ-112-AS	431.05	430.46	429.80	429.53	430.73
PZ-113-AS	431.07	430.47	429.93	429.48	430.79
PZ-114-AS	431.20	430.67	430.09	429.93	431.60
PZ-205-AS	430.98	430.54	431.04	429.85	430.68
PZ-207-AS	431.10	430.52	429.97	429.66	431.12
PZ-300-AS	434.11	434.03	433.72	434.02	****
PZ-302-AS	431.34	430.80	430.27	430.03	431.26
PZ-303-AS	431.28	430.64	430.03	429.77	430.99
PZ-304-AS	431.13	430.52	429.93	429.59	431.07
Intermediate Alluvial Piezometers					
PZ-302-AI	431.27	430.66	430.08	426.75	431.10
PZ-304-AI	431.16	430.57	429.96	429.62	431.13
PZ-305-AI	431.03	430.56	429.93	429.79	430.65
Deep Alluvial Piezometers					
PZ-113-AD	431.03	430.44	429.92	429.62	430.81
PZ-300-AD	432.12	431.44	430.73	430.63	****
St. Louis/Upper Salem Hydrologic Unit Piezometers					
PZ-100-SS	413.63	413.46	413.20	412.87	412.83
PZ-101-SS	387.48	385.28	385.58	385.24	385.09
PZ-102-SS	Inactive	Inactive	Inactive	Inactive	Inactive

Notes provided on page 4

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued					
PZ-102R-SS	420.59	404.70	404.61	418.91	418.24
PZ-103-SS	361.47	362.30	362.01	362.85	363.71
PZ-104-SS	361.53	365.31	362.92	362.99	376.44
PZ-105-SS	343.21	357.52	350.46	356.22	376.83
PZ-106-SS	343.70	359.94	347.42	357.55	371.56
PZ-107-SS	430.90	430.24	429.58	429.35	430.34
PZ-108-SS	346.47	351.88	346.25	356.00	359.97
PZ-109-SS	350.40	350.84	350.87	350.78	352.41
PZ-110-SS	429.87	429.09	428.31	427.51	428.65
PZ-113-SS	431.16	430.58	430.06	429.65	430.89
PZ-115-SS	414.34	413.23	406.34	414.31	423.51
PZ-116-SS	330.68	351.62	346.13	337.96	353.41
PZ-200-SS	412.73	412.42	412.14	412.03	412.05
PZ-201-SS	452.45	452.24	452.21	451.88	451.69
PZ-201A-SS	412.13	411.92	411.92	412.06	412.03
PZ-202-SS	438.64	441.28	440.27	441.20	441.81
PZ-203-SS	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)
PZ-204-SS	431.58	440.83	439.74	440.02	441.19
PZ-204A-SS	403.78	405.38	405.15	405.46	406.69
PZ-205-SS	420.28	419.93	419.10	419.11	420.13

Notes provided on page 4

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued					
PZ-206-SS	414.13	413.86	413.53	413.80	414.81
PZ-208-SS	428.60	428.93	426.41	428.87	432.54
PZ-300-SS	427.50	427.88	426.56	426.58	****
PZ-301-SS	395.65	407.66	415.13	420.17	423.94
PZ-1201-SS	376.00	378.52	372.92	379.44	NM
MW-1206	348.17	359.29	350.53	359.27	****
Deep Salem Piezometers					
PZ-100-SD	355.04	363.01	357.73	372.88	367.82
PZ-104-SD	343.15	361.88	348.24	360.25	370.88
PZ-106-SD	341.52	356.82	346.26	350.17	364.81
PZ-111-SD	430.63	430.06	429.43	428.90	429.00
MW-1204	306.96	356.52	318.98	332.51	344.32
MW-1205	339.32	350.89	314.15	342.90	****
Keokuk Piezometers					
PZ-100-KS	432.69	435.10	433.96	435.71	435.56
PZ-104-KS	440.22	443.10	441.74	442.94	443.35
PZ-106-KS	438.61	440.70	439.91	440.50	440.68
PZ-111-KS	438.77	440.04	439.92	440.13	440.16

Notes provided on page 4

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Leachate Elevation				
Leachate Risers					
LR-100	449.77	450.14	450.60	450.61	451.64
LR-102	452.28	452.18	452.22	452.51	452.30
LR-103	431.00	430.58	429.98	429.71	430.75
LR-104	431.01	430.56	429.95	429.82	430.59
LR-105	453.39	453.40	453.61	453.70	453.43
Surface Water Elevation					
Staff Gauges					
SG-8	433.68	433.98	(Dry)	433.99	433.07
SG-9	433.68	433.98	(Dry)	433.97	433.02

NOTES:

NA = Not available. Water level data was not collected on the indicated date either because the piezometer, leachate riser, or staff gauge had not yet been installed, or development was not yet completed. An equipment malfunction prevented measurement of the water level in PZ-206-SS on December 14, 1995.

PZ-102-SS was replaced by PZ-102R-SS, and is inactive.

LR-101 was not installed because leachate was not present.

All elevations provided in feet above Mean Sea Level (MSL)

**** = Wells decommissioned in May.

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 30, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
Shallow Alluvial Piezometers							
PZ-112-AS	436.12	435.12	434.67	432.84	432.13	431.84	431.15
PZ-113-AS	435.64	435.30	434.63	432.91	432.19	431.81	431.18
PZ-114-AS	435.94	435.35	434.90	433.06	432.11	431.93	431.23
PZ-205-AS	434.41	434.33	434.06	432.52	431.90	431.66	431.19
PZ-207-AS	435.94	435.41	434.91	433.02	432.29	431.87	431.19
PZ-300-AS	NA	NA	NA	NA	436.41	435.50	434.94
PZ-302-AS	NA	NA	NA	NA	432.34	432.08	431.86
PZ-303-AS	NA	NA	NA	NA	432.19	432.01	431.74
PZ-304-AS	NA	NA	NA	NA	432.19	431.91	431.63
Intermediate Alluvial Piezometers							
PZ-302-AI	NA	NA	NA	NA	432.16	432.00	431.73
PZ-304-AI	NA	NA	NA	NA	432.19	431.98	431.66
PZ-305-AI	NA	NA	NA	NA	431.10	431.80	431.34
Deep Alluvial Piezometers							
PZ-113-AD	435.68	435.13	433.74	432.89	432.28	431.82	431.18
PZ-300-AD	NA	NA	NA	NA	432.89	432.78	432.41
St. Louis/Upper Salem Hydrologic Unit Piezometers							
PZ-100-SS	405.36	416.06	415.23	414.35	414.04	413.85	413.68
PZ-101-SS	393.23	394.58	393.37	390.00	388.96	387.58	386.76
PZ-102-SS	413.54	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive

Notes provided on pages 4 and 8

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 30, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued							
PZ-102R-SS	403.09	424.30	424.87	422.80	421.99	421.63	420.78
PZ-103-SS	363.03	373.02	363.73	360.95	360.69	361.05	360.15
PZ-104-SS	340.67	360.04	366.22	361.01	360.34	360.41	360.55
PZ-105-SS	336.26	339.83	352.45	346.80	343.23	342.76	342.53
PZ-106-SS	359.72	357.60	364.20	349.41	350.41	350.01	342.64
PZ-107-SS	434.52	434.30	434.00	432.36	431.91	431.57	431.12
PZ-108-SS	368.99	368.99	367.02	352.14	355.88	356.78	347.44
PZ-109-SS	370.70	373.74	360.45	359.20	354.64	355.12	351.80
PZ-110-SS	413.76	433.53	433.27	431.57	430.93	430.58	430.11
PZ-113-SS	435.70	435.23	434.79	433.00	432.29	431.94	427.33
PZ-115-SS	426.75	424.83	424.18	417.06	413.09	411.71	407.86
PZ-116-SS	NA	346.79	356.46	338.17	333.08	331.43	330.07
PZ-200-SS	415.05	415.45	415.59	414.38	413.34	412.78	412.91
PZ-201-SS	456.42	455.53	454.86	453.55	453.14	452.98	452.80
PZ-201A-SS	415.03	414.63	414.38	412.94	412.85	412.57	412.12
PZ-202-SS	444.36	444.78	444.14	441.33	440.20	439.70	439.13
PZ-203-SS	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)
PZ-204-SS	442.82	441.49	438.10	431.82	429.64	430.57	429.71
PZ-204A-SS	NA	405.65	405.53	404.05	403.82	403.55	403.45
PZ-205-SS	424.46	424.04	423.45	421.75	421.69	421.28	420.50

Notes provided on pages 4 and 8

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 30, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued							
PZ-206-SS	420.04	419.04	418.22	415.49	415.34	415.19	NA
PZ-208-SS	NA	436.44	435.60	431.63	429.86	428.83	426.97
PZ-300-SS	NA	NA	NA	NA	428.62	428.32	427.80
PZ-301-SS	NA	NA	NA	NA	358.09	357.19	384.19
PZ-1201-SS	NA	392.33	365.30	377.98	375.25	374.88	374.88
MW-1206	368.19	367.12	367.86	351.67	361.31	362.46	348.15
Deep Salem Piezometers							
PZ-100-SD	394.61	370.68	381.79	366.35	363.78	364.43	356.68
PZ-104-SD	359.05	356.64	362.97	344.33	341.68	341.90	339.05
PZ-106-SD	358.64	353.52	361.98	348.44	346.40	347.38	340.60
PZ-111-SD	373.70	423.87	428.55	432.22	431.90	431.47	430.93
MW-1204	333.83	330.01	357.27	305.57	324.30	303.18	309.24
MW-1205	352.28	357.38	296.81	341.10	347.04	317.88	337.07
Keokuk Piezometers							
PZ-100-KS	438.17	438.93	437.84	434.72	433.90	433.67	432.84
PZ-104-KS	444.63	444.74	444.27	441.98	440.99	440.77	440.42
PZ-106-KS	442.18	442.51	442.48	440.30	439.47	439.02	438.82
PZ-111-KS	441.58	441.91	442.01	440.39	439.68	439.14	438.85

Notes provided on pages 4 and 8

TABLE 1
GROUNDWATER, LEACHATE AND SURFACE WATER ELEVATION SUMMARY
WEST LAKE LANDFILL OU-2

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 30, 1995	Nov. 18, 1995	Dec. 14, 1995
	Leachate Elevation						
Leachate Risers							
LR-100	NA	NA	NA	NA	450.68	450.42	449.90
LR-102	NA	NA	NA	NA	454.07	452.38	452.31
LR-103	NA	NA	NA	NA	432.10	431.86	431.32
LR-104	NA	NA	NA	NA	432.04	432.20	431.35
LR-105	NA	NA	NA	NA	451.81	452.44	452.38
	Surface Water Elevation						
Staff Gauges							
SG-8	NA	NA	NA	NA	433.92	433.54	432.75
SG-9	NA	NA	NA	NA	433.92	433.54	432.75

NOTES:

NA = Not available. Water level data was not collected on the indicated date either because the piezometer, leachate riser, or staff gauge had not yet been installed, or development was not yet completed. An equipment malfunction prevented measurement of the water level in PZ-206-SS on December 14, 1995.

PZ-102-SS was replaced by PZ-102R-SS, and is inactive.

LR-101 was not installed because leachate was not present.

All elevations provided in feet above Mean Sea Level (MSL)

TABLE 2
GROUNDWATER ELEVATION SUMMARY
EXISTING MONITORING WELLS
WEST LAKE LANDFILL OU-2

Monitoring Location	Date					
	Dec. 14, 1995	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	April 3, 1996	May 3, 1996
	Groundwater Elevation					
Shallow Alluvial Monitoring Wells						
S-1	431.19	430.89	430.37	429.77	429.57	431.51
S-5	431.31	431.03	430.56	430.05	429.69	430.68
S-8	431.01	430.84	430.36	429.70	429.53	431.45
S-10	431.17	431.11	430.39	429.82	429.42	431.01
S-51	431.91	431.59	431.15	430.41	430.48	431.25
S-53	431.79	431.30	430.77	430.13	429.91	431.31
S-61	431.20	430.85	430.39	429.77	429.49	431.12
S-75	432.76	432.18	432.21	432.18	432.19	433.17
S-80	434.61	434.24	434.18	433.92	434.12	****
S-82	431.36	431.03	430.42	429.80	429.57	431.10
S-84	NM	430.36	427.51	NM	429.16	NM
S-88	NM	431.05	430.62	429.90	429.65	430.72
MW-F1S	431.36	431.04	461.35	429.96	429.66	430.61
MW-101	428.33	430.79	430.33	429.68	429.46	431.17
MW-102	431.14	431.02	430.38	429.76	429.51	431.10
MW-103	431.59	431.05	430.50	430.07	429.70	431.61
MW-104	431.74	431.25	430.64	430.00	429.85	431.18
MW-107	441.68	442.15	441.44	441.48	442.46	443.79
MW-F3	431.15	430.84	430.52	429.87	429.63	431.35
Intermediate Alluvial Monitoring Wells						
I-2	431.01	430.94	430.35	429.74	429.51	431.15
I-4	431.25	430.95	430.53	430.12	429.65	430.93
I-7	435.07	434.84	434.33	433.71	433.47	435.15
I-9	431.27	431.01	430.41	429.82	429.59	431.12
I-11	430.87	430.92	430.41	429.85	429.52	431.11
I-50	432.38	432.09	431.46	430.75	430.61	****
I-62	431.03	430.85	430.34	429.70	429.50	431.35
I-65	431.08	430.76	430.42	429.75	429.51	431.29
I-66	431.13	430.87	430.53	429.84	429.63	431.30
I-67	431.18	431.03	431.18	429.96	429.74	431.54
I-68	431.18	431.05	430.62	430.02	429.86	431.62
I-73	430.71	430.39	430.02	429.44	429.04	430.14

TABLE 2
GROUNDWATER ELEVATION SUMMARY
EXISTING MONITORING WELLS
WEST LAKE LANDFILL OU-2

Monitoring Location	Date					
	Dec. 14, 1995	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	April 3, 1996	May 3, 1996
	Groundwater Elevation					
Deep Alluvial Monitoring Wells						
D-3	431.30	430.89	430.50	429.97	429.62	430.88
D-6	431.14	430.83	430.29	429.69	429.44	431.09
D-12	431.15	430.93	430.39	429.75	429.49	431.06
D-13	431.14	430.91	430.44	429.86	429.61	431.32
D-14	429.35	429.15	428.93	428.54	428.08	430.02
D-81	431.81	431.29	430.72	430.10	429.89	431.23
D-83	431.02	430.71	430.29	429.66	429.47	430.65
D-85	424.79	431.02	430.61	430.00	429.74	431.33
D-87	431.73	430.94	430.43	429.93	429.51	430.83
D-93	429.88	429.56	428.96	428.33	428.11	429.66
MW-F1D	428.29	431.01	430.55	429.89	429.61	430.63

NM = Not measured

**** == Well decommissioned in May 1996

TABLE 3
WEST LAKE LANDFILL OPERABLE UNIT 2 RI/FS
BACKGROUND GROUNDWATER QUALITY RESULTS
DECEMBER 1995 SAMPLING EVENT

Parameter	GW-300-AS mg/l	GW-300-AD mg/l	GW-300-SS mg/l	GW-S-80 mg/l	GW-I-50 mg/l	GW-MW-107 mg/l
Calcium	142	176	73.9	151	159	131
Potassium	<5	6.1	<5	5.4	<5	<5
Magnesium	41.6	61.1	56.4	51.5	57.9	52.6
Sodium	73.0	38.6	10.7	66.1	35.4	35.8
Chloride	210	150	6	250	160	130
Sulfate	110	100	20	67	26	70
Bicarbonate as Alkalinity	280	460	500	330	460	400
Nitrate/Nitrite	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chemical Oxygen Demand	<20	<20	50	<20	<20	40

TABLE 4
WEST LAKE LANDFILL OPERABLE UNIT 2 RI/FS
BACKGROUND GROUNDWATER RADIONUCLIDE RESULTS

Well/ Piezometer	Gross Alpha	Gross Beta	Ra-226	Ra-228	U-238	U-235/236	U-234	Th-232	Th-230	Th-228
GW-300-AS (unfiltered)	<3.53	9.34 ± 1.64	0.31 ± 0.05	<0.55	0.57 ± 0.20	<0.17	0.74 ± 0.23	0.22 ± 0.14	0.51 ± 0.21	<0.14
GW-300-AS (filtered)	<4.18	4.08 ± 2.28	0.20 ± 0.03	<0.32	0.55 ± 0.18	<0.13	0.58 ± 0.19	<0.21	0.26 ± 0.18	<0.20
GW-300-AD (unfiltered)	5.49 ± 3.51	8.47 ± 2.43	0.51 ± 0.07	1.00 ± 0.54	0.26 ± 0.13	<0.13	0.32 ± 0.15	0.13 ± 0.11	0.83 ± 0.30	0.18 ± 0.13
GW-300-AD (filtered)	<4.05	<4.07	0.35 ± 0.05	<0.41	0.17 ± 0.09	<0.10	0.40 ± 0.15	0.12 ± 0.08	0.50 ± 0.19	<0.10
GW-300-SS (unfiltered)	3.51 ± 2.69	4.37 ± 2.25	0.78 ± 0.09	0.39 ± 0.37	0.25 ± 0.13	0.32 ± 0.17	0.80 ± 0.26	<0.092	0.84 ± 0.29	<0.13
GW-300-SS (filtered)	<3.32	<3.72	0.60 ± 0.08	<0.43	0.50 ± 0.20	0.13 ± 0.11	0.89 ± 0.28	<0.11	0.29 ± 0.17	<0.15
GW-S-80 (unfiltered)	56.1 ± 9.5	53.1 ± 6.2	0.44 ± 0.06	<0.65	1.19 ± 0.35	0.27 ± 0.17	0.99 ± 0.31	0.86 ± 0.28	1.48 ± 0.40	0.85 ± 0.28
GW-S-80 (filtered)	<7.02	<3.94	0.19 ± 0.04	<0.42	0.63 ± 0.21	0.16 ± 0.11	0.88 ± 0.26	<0.11	0.31 ± 0.16	<0.13
GW-I-50 (unfiltered)	<4.32	5.12 ± 2.52	0.42 ± 0.06	<0.40	0.15 ± 0.10	0.18 ± 0.12	0.43 ± 0.18	0.17 ± 0.12	1.00 ± 0.33	<0.12
GW-I-50 (filtered)	<4.06	6.02 ± 3.00	0.29 ± 0.04	<0.48	<0.097	<0.14	0.25 ± 0.13	0.21 ± 0.13	0.93 ± 0.30	<0.11
GW-MW-107 (unfiltered)	<4.64	4.38 ± 2.49	<0.066	<0.68	0.26 ± 0.13	<0.09	0.43 ± 0.17	0.33 ± 0.17	0.29 ± 0.16	0.26 ± 0.15
GW-MW-107 (filtered)	<3.03	<3.96	0.069 ± 0.029	<0.39	0.36 ± 0.16	<0.10	0.39 ± 0.17	<0.085	0.27 ± 0.15	<0.11

All results in pCi/L
Samples collected in December 1995

ATTACHMENT 1

DATA VALIDATION LETTER

MEMORANDUM

TO: West Lake Landfill, Operable Unit 2 QA file June 3, 1996

FR: Jay Corgiat/A. Michael Hirt, Golder Associates Inc.

RE: DATA VALIDATION OF ANALYTICAL RESULTS
GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WEST LAKE LANDFILL, OPERABLE UNIT 2
BRIDGETON, MISSOURI

This memorandum presents the findings of the data validation performed on the analytical results for groundwater samples collected in December 1995 from the Bridgeton Landfill Site. The samples were analyzed for selected groundwater quality parameters, metals, and radiological parameters by SW-846, and other approved methodologies as specified in the August 1995, Remedial Investigation/Feasibility Study Quality Assurance Project Plan (QAPP; Reference 1). Groundwater quality parameters and metals analyses were performed by Quanterra of North Canton, Ohio. Radiological analyses were performed by Quanterra of Earth City, Missouri.

A filtered and an unfiltered groundwater sample was collected from each of six monitoring wells These twelve (12) investigative groundwater samples, two (2) field blanks, and two (2) trip blanks were submitted for analyses. The Quanterra Project number for groundwater quality parameters and metals analyses is A5L130149. The Quanterra Project number for radiological parameters is 614.01.

DATA QUALITY OBJECTIVES

Precision. Goals for precision were met when measured. See Data Validation Summary for analytes and samples where minimum QA results for precision were not reported.

Accuracy. Goals for accuracy were met when measured except for the chloride percent recovery for the matrix spike duplicate of sample GW-300-AS-unfiltered. See Data Validation Summary for analytes and samples where minimum QA for accuracy were not measured.

Sample Result Verification. Raw data was not provided by the laboratory.

Detection Limits. Detection limit goals were met for the samples except for four samples analyzed for gross α and β (See Data Validation Summary).

Completeness. The overall goal of 95 % completeness was met.

Holding Times. Holding time requirements were met for the samples.

Data Validation Summary

QA/QC accuracy criteria specified in the August 1995, Remedial Investigation/Feasibility Study QAPP were met for the samples, except in the following instance:

- The chloride percent recovery (%R) for the matrix spike duplicate was less than the lower QC limit of 87% for sample GW-300-AS-unfiltered (%R = 86%). Because the matrix spike percent recovery was within QC limits and the amount of the exceedance was relatively small, no qualification of the data was warranted.

QA/QC procedures specified in the August 1995, Remedial Investigation/Feasibility Study QAPP were met for the samples, except in the following instances:

- Sample GW-300-SS-unfiltered, collected for COD and nitrate-nitrite analysis, was received by the laboratory with the lid off. As a result, the contents of the sample container had drained into the plastic bag in which the sample was transported. The groundwater in the plastic bag, designated as Quanterra sample number A5L130149-017, was analyzed for COD and nitrate-nitrite. A second sample was split by the laboratory from a different container containing an unpreserved sample of GW-300-SS-unfiltered groundwater. This split sample, designated as Quanterra sample number A5L130149-007, was immediately preserved with H_2SO_4 and analyzed. Because of the possibility that the bottle label, the ink on the label, and any soil on the outside of the jar could affect COD and nitrate-nitrite results of the sample from the plastic bag (Quanterra sample number A5L130149-017), the COD and nitrate-nitrite analysis results have been rejected. Qualification of COD and nitrate-nitrite analysis results from the sample split (Quanterra sample number A5L130149-007) are not warranted.

- The MS/MSD results reported for calcium, potassium, magnesium, and sodium were from two months prior to sample analysis. These QA/QC results do not appear to be related to the investigative samples. However, no qualification of the data was warranted.

- No laboratory duplicate analysis results were reported for alkalinity, gross α and β, radium 226/228, isotopic uranium, and isotopic thorium. No qualification of the data was warranted.

- Carrier percent recovery was not reported for radium 226/228, isotopic uranium, and isotopic thorium. No qualification of the data was warranted.

- No laboratory control sample results were reported for Uranium 235/236. No qualification of the data was warranted.

- Parameters detected in field, trip, and laboratory blanks are summarized in Table 1. A method blank result is considered acceptable if the value is less than ten times the sample activity. The method blank results for these samples are acceptable. The method blank QCBLK86887-1 result for uranium 234 was explained in the case narrative to be the result of "smearing". Our review indicates that smearing was not evident in the samples or the laboratory control samples and uranium 234 activity was

below the contract required detection limit for the samples. Therefore, no qualification of the data was necessary.

TABLE 1. COMPOUNDS DETECTED IN BLANKS.

Sample (Quanterra Sample #)	Analyte	Concentration ± 2 sigma error
GW-EB-1 (9995-012)	radium-226	0.039 ± 0.016 pCi/L
GW-EB-1-filtered (9995-013)	radium-226	0.035 ± 0.016 pCi/L
GW-EB-1 (9995-012)	uranium-234	0.21 ± 0.11 pCi/L
GW-EB-1-filtered (9995-013)	uranium-238	0.10 ± 0.07 pCi/L
GW-EB-1-filtered (9995-013)	uranium-235/236	0.22 ± 0.12 pCi/L
GW-EB-1-filtered (9995-013)	uranium-234	0.30 ± 0.13 pCi/L
Trip blank-filtered and unfiltered combined (9995-014)	uranium-238	0.17 ± 0.10 pCi/L
Trip blank-filtered and unfiltered combined (9995-014)	uranium-235/236	0.23 ± 0.13 pCi/L
Trip blank-filtered and unfiltered combined (9995-014)	uranium-234	0.46 ± 0.17 pCi/L
Method Blank (QCBLK86887-1)	uranium-235/236	0.85 ± 0.49 pCi/L
Method Blank (QCBLK86887-1)	uranium-234	2.43 ± 0.43 pCi/L
GW-EB-1 (9995-012)	thorium-232	0.17 ± 0.11 pCi/L
GW-EB-1 (9995-012)	thorium-230	0.68 ± 0.15 pCi/L
GW-EB-1-filtered (9995-013)	thorium-232	0.14 ± 0.10 pCi/L
GW-EB-1-filtered (9995-013)	thorium-230	0.61 ± 0.21 pCi/L
Trip blank-filtered and unfiltered combined (9995-014)	thorium-232	0.16 ± 0.10 pCi/L
Trip blank-filtered and unfiltered combined (9995-014)	thorium-230	1.29 ± 0.36 pCi/L
Method Blank (QCBLK86884-1)	thorium-230	0.32 ± 0.16 pCi/L

REFERENCES

1. Remedial Investigation/Feasibility Study Work Plan, Appendix A, Sampling and Analysis Plan, West Lake Landfill Operable Unit 2, Bridgeton, Missouri, August 1995.